

What is claimed is:

1. An RF module having a plurality of through holes, in which an electromagnetic wave propagates by using a region surrounded by the through holes,

wherein the plurality of through holes are arranged so as to satisfy the following conditional expression (A) where  $d$  denotes an interval between centers of neighboring through holes and  $r$  indicates a radius of each of the through holes.

$$2.0r < d < 10.0r \quad \text{..... (A)}$$

2. An RF module according to claim 1, constructed as a resonator of which side wall is formed by the plurality of through holes,

wherein the plurality of through holes are arranged so as to satisfy the following conditional expression (A-1).

$$3.6r < d < 4.0r \quad \text{..... (A-1)}$$

3. An RF module according to claim 1, constructed as a transmission line of which side wall is formed by the plurality of through holes,

wherein the plurality of through holes are arranged so as to satisfy the following conditional expression (A-2).

$$3.6r < d < 10.0r \quad \text{..... (A-2)}$$

4. An RF module according to claim 1, constructed as a resonator of which side wall is formed by the plurality of through holes,

wherein the plurality of through holes are arranged so that attenuation of an electromagnetic wave in a non-propagation region between neighboring through holes is 20 dB or higher.

5. An RF module according to claim 1, constructed as a transmission line of which side wall is formed by the plurality of through holes,

wherein the plurality of through holes are arranged so that attenuation of an electromagnetic wave in a non-propagation region between neighboring through holes is 15 dB or higher.

6. An RF module according to claim 1, having a non-uniform electromagnetic wave intensity distribution,

wherein the plurality of through holes are arranged so that the higher the electromagnetic field intensity is in a region, the smaller a center interval "d" is with respect to the radius "r" of each through hole.

7. An RF module according to claim 1, wherein a frequency bandwidth of the electromagnetic wave is a range from 20 GHz to 120 GHz.

8. An RF module according to claim 1, wherein when a wavelength corresponding to a cut-off wavelength  $f_0$  of a frequency of at least a part of a frequency band used is  $\lambda_0$ ,

$\lambda_0/4 < g$  (where  $g = d - 2r$ ) is satisfied.

9. A method of arranging through holes in an RF module having a plurality of through holes, in which an electromagnetic wave propagates by using a region surrounded by the through holes,

wherein the plurality of through holes are arranged so as to satisfy the following conditional expression (A) where  $d$  denotes an interval between centers of neighboring through holes and  $r$  indicates a radius of each of the through holes.

$$2.0r < d < 10.0r \quad \dots\dots (A)$$

10. A method of arranging through holes in an RF module having a plurality of through holes, in which an electromagnetic wave propagates by using a region surrounded by the through holes,

wherein the relation between an interval " $d$ " between centers of neighboring through holes and the radius " $r$ " of each through hole is obtained from required attenuation of an electromagnetic wave, and

arrangement of the through holes is determined on the basis of the obtained relation.

11. A method of arranging through holes in the RF module according to claim 9 or 10, wherein when a wavelength corresponding to a cut-off wavelength  $f_0$  of a frequency of at least a part of a frequency band used is  $\lambda_0$ , the through holes are arranged so as to satisfy

$$\lambda_0/4 < g \quad (\text{where } g = d - 2r).$$